

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
28 August 2003 (28.08.2003)

PCT

(10) International Publication Number  
**WO 03/070523 A1**

(51) International Patent Classification<sup>7</sup>: **B60R 13/02**, 21/04

(21) International Application Number: PCT/US03/04135

(22) International Filing Date: 11 February 2003 (11.02.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/358,068 19 February 2002 (19.02.2002) US

(71) Applicant (for all designated States except US): **INTIER AUTOMOTIVE INC.** [CA/CA]; 521 Newpark Boulevard, Newmarket, L3Y 4X7 Ontario (CA).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LIPKE, Clarence, P.** [CA/US]; 11374 Nora Drive, Fenton, MI 48430 (US). **SHIELDS, Scott, Douglas** [US/US]; 8090 High Point Trail, White Lake, MI 48386 (US).

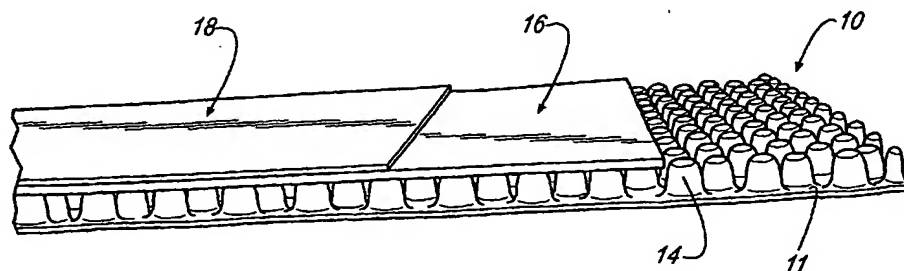
(74) Agents: **RASHID, Peter, J.** et al.; Rader, Fishman & Grauer PLLC, 39533 Woodward Avenue, Suite 140, Bloomfield Hills, MI 48304 (US).

**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DIMPLED RECYCLABLE SUBSTRATE FOR AN INTERIOR TRIM PANEL



(57) Abstract: An interior trim panel, such as a headliner, formed by a substrate composed of a fibrous or porous batt material, such as polyethylene terephthalate (PET). The substrate includes a first, back side and second, front side. In order to increase the strength of the substrate, dimples or impressions are formed in the back side of the substrate and corresponding projections are formed extending from the opposite front side by simultaneously compressing both sides of the fibrous batt material. A structural layer of material is then attached to the substrate, preferably to the projections of the substrate, resulting in an "I-beam" structure that further enhances the strength of the interior trim panel. In another embodiment, a second layer of fibrous or porous batt material may be placed between the projections before fixedly attaching the structural layer of material to the substrate.

## **DIMPLED RECYCLABLE SUBSTRATE FOR AN INTERIOR TRIM PANEL**

### **BACKGROUND OF THE INVENTION**

#### **Field of the Invention**

This invention is generally related to automotive interior trim panels, and in particular to a headliner composed of a fibrous or porous batt material, such as polyethylene terephthalate (PET) or the like, and a method for making the same.

#### **Description of the Related Art**

It is desirable within the field to produce an automotive trim panel, such as a headliner, composed of one type of material thereby permitting easier production along with easier recycling of excess or scrap material. The current standard is to use a fibrous batt material, such as polyethylene terephthalate (PET), which allows for easy molding and recycling. However, current headliners comprised of 100% PET typically lack sufficient durability and strength to carry modular components often required by them. To accommodate for this lack of durability and strength, either other types of material, such as glass, are added, which renders the headliner non-recyclable, or additional layers of raw material must be used, thereby needlessly increasing the overall weight of the headliner.

### **SUMMARY OF THE INVENTION**

The invention is directed to a substrate for an interior trim panel, such as a headliner, including a substrate composed of a fibrous or porous batt material, such as PET, which has a significant level of strength while minimizing the use of material to form a headliner that is relatively light in weight as compared to conventional headliners. This is accomplished by forming impressions or dimples into a first, back side of the PET batt material that extend through the full thickness of the layer to create projections that extend outward from a second, front side of the PET batt material. The impressions or dimples are formed by compressing both sides of the PET batt material to form a substrate with a relatively high density, but lighter weight as compared to the conventional substrates. After compression of the PET batt material, a layer of material is then attached to the

substrate such that the combination of the layer of material and the projections of the substrate form an "I-beam" structure that enhances the strength of the interior trim panel.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

In the drawings:

Figure 1 is a rear perspective view depicting a dimpled, recyclable substrate in accordance with the present invention.

Figure 2 is a front perspective view depicting a headliner formed with the dimpled, recyclable substrate in accordance with the present invention.

Figure 3 is a side perspective view of the headliner of Figure 2 in accordance with the present invention.

Figure 4a is a depiction of a first step in a method of manufacturing a dimpled, recyclable substrate in accordance with the present invention.

Figure 4b is a depiction of the second step in the method of manufacturing the dimpled, recyclable substrate in accordance with the present invention.

### **DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring now to Figs. 1-3, the interior trim part of the invention comprises a substrate 10 formed of a fibrous sheet of polyethylene terephthalate (PET) batt material with a first, front side 11 and a second, back side 13. Specifically, the substrate 10 is formed to have dimples or impressions 12 running from the back side 13 of the substrate 10 and penetrate through the full thickness of the substrate 10 to the front side 11, resulting in a corresponding number of projections 14 extending outward from the front side 11 of the substrate 10. As used herein, the front side 11 of the substrate 10 is defined by the surface of the substrate 10 that is toward the interior of the vehicle (not shown), and the back side 13 of the substrate 10 is defined by the surface of the substrate 10 that is away from the interior of the vehicle.

After forming the dimples or impressions 12 and the corresponding projections 14, a structural layer of material 16 also made of recyclable PET material is attached to the projections 14 of the substrate 10, thereby forming an interior trim part that is made of 100% recyclable material. As best shown in Fig. 3, the combination of the structural layer

of material 16 and the projections 14 results in an "I-beam" structure that has a synergistic effect of imparting greater strength to the headliner than either the substrate 10 or the structural layer of material 16 alone possesses. After the structural layer of material 16 is attached to the projections 14, a face fabric 18 can then be applied upon the second layer 16 to achieve an aesthetically pleasing appearance of the interior trim part. Alternatively, the face fabric 18 may be omitted or the structural layer of material 16 and the face fabric 18 may be designed to be one in the same.

Unlike conventional interior trim panels, the substrate 10 of the present invention is compressed on both the front and rear sides 11, 13 to form the impressions or dimples 12 that extend through its full thickness and the corresponding projections 14 that project outward from the front side 11. By compressing the front and rear sides 11, 13 of the substrate 10, a greater consolidation or higher density of fibers within the substrate 10 is realized. This process results in significantly enhanced strength while minimizing the amount of material used. As a result, a lightweight, but sufficiently strong interior trim panel can be achieved.

In the embodiment depicted in Figs. 1-3, the impressions 12 and corresponding projections 14 are circular in shape. However, it will be appreciated that the invention is not limited to a shape of the impressions 12 and the corresponding projections 14, and that the invention can be practiced by using a variety of other desirable shapes based on matters such as preference, application or production considerations. Such shapes include, but are not limited to, square, diamond, hexagonal, rectangular, octagonal, triangular, or any polygonal shape.

As depicted in Figure 1, the impressions 12 and corresponding projections 14 are arranged in a substantially linear pattern, with adjacent rows being offset from each other. This arrangement allows for an optimum number of impressions 12 and projections 14 per unit area to be achieved, leading to greater strength of the substrate 10 as compared to conventional substrates. However, it will be appreciated that the invention is not limited to this arrangement, but can be practiced by arranging the impressions 12 and the projections 14 in a variety of other geometric patterns depending on factors such as application or production considerations. Such patterns include, but are not limited to, square, diamond, hexagonal, rectangular, octagonal, triangular, or any geometric pattern that optimizes the

number of impressions 12 and projections 14 per unit area of the substrate 10 for a particular application.

Figures 4a and 4b illustrate a method of manufacturing an interior trim panel, such as a headliner, with the substrate 10 and layer of material 16 according to the embodiment of the invention described above. Initially, a fibrous batt of PET material 20 is fed into a roller press 22 to compress and simultaneously create the impressions 12 on the back side 13 and the corresponding projections 14 extending outwardly from the front side 11, as shown in Fig. 4a. The fibrous batt 20 may be heated by a heater 21 prior to being compressed by the roller press 22. The compressed fibrous batt forming the substrate 10 has a higher density as compared to an uncompressed fibrous batt. The substrate 10 and the second, structural layer of material 16 are both fed into a compression heater 24 to fixedly attach the layer of material 16 to the projections 14 of the substrate 10. Then, the headliner substrate 10 with the attached structural layer of material 16 is cut to a desired length by a cutting means 26, such as a blade, or the like. As shown in Fig. 4b, the subsequent headliner substrate 10 could then be molded into the desired shape by a press 28. The headliner substrate 10 can be heated by an oven 27 prior to being molded by the press 28.

Alternatively, a second fibrous batt of PET material (not shown) can be placed between the projections 14 before the second layer of material 16 is fixedly attached to the substrate 10. Because the second batt of PET material is formed between the projections 14, this alternate embodiment of the invention provides improved sound absorbing properties, as compared to the first embodiment of the invention without the second fibrous batt.

Although not shown in Figs. 4a and 4b, the face fabric 18 may be attached to the structural layer of material 16 in a manner similar to attaching the structural layer of material 16 to the substrate 10 prior to or subsequent to molding of the headliner substrate 10 to the desired shape by the press 24.

While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation, and the scope of the appended claims should be construed as broadly as the prior art will permit.

## CLAIMS

What is claimed is:

1. An interior trim panel, comprising:  
  
a substrate compressed on both sides so as to form impressions in one side that extend through a full thickness of said substrate so as to create corresponding projections extending outwardly from an opposite side of said substrate; and  
  
a layer of material adhered to said projections of said substrate,  
  
wherein said layer of material and said projections of said substrate form an "I-beam" structure that enhances the strength of said interior trim panel.
2. The interior trim panel according to Claim 1, wherein said substrate and said layer of material are comprised of polyethylene terephthalate (PET) material.
3. The interior trim panel according to Claim 1, wherein said impressions are formed on a back side of said substrate, and wherein said projections extend from a front side of said substrate.
4. The interior trim panel according to Claim 1, wherein said impressions and projections are arranged so as to have a maximum number per unit area of substrate.
5. The interior trim panel according to Claim 1, wherein said substrate and said layer are molded to form a headliner.
6. The interior trim panel according to Claim 1, further comprising a face fabric attached to said layer of material.

1/3

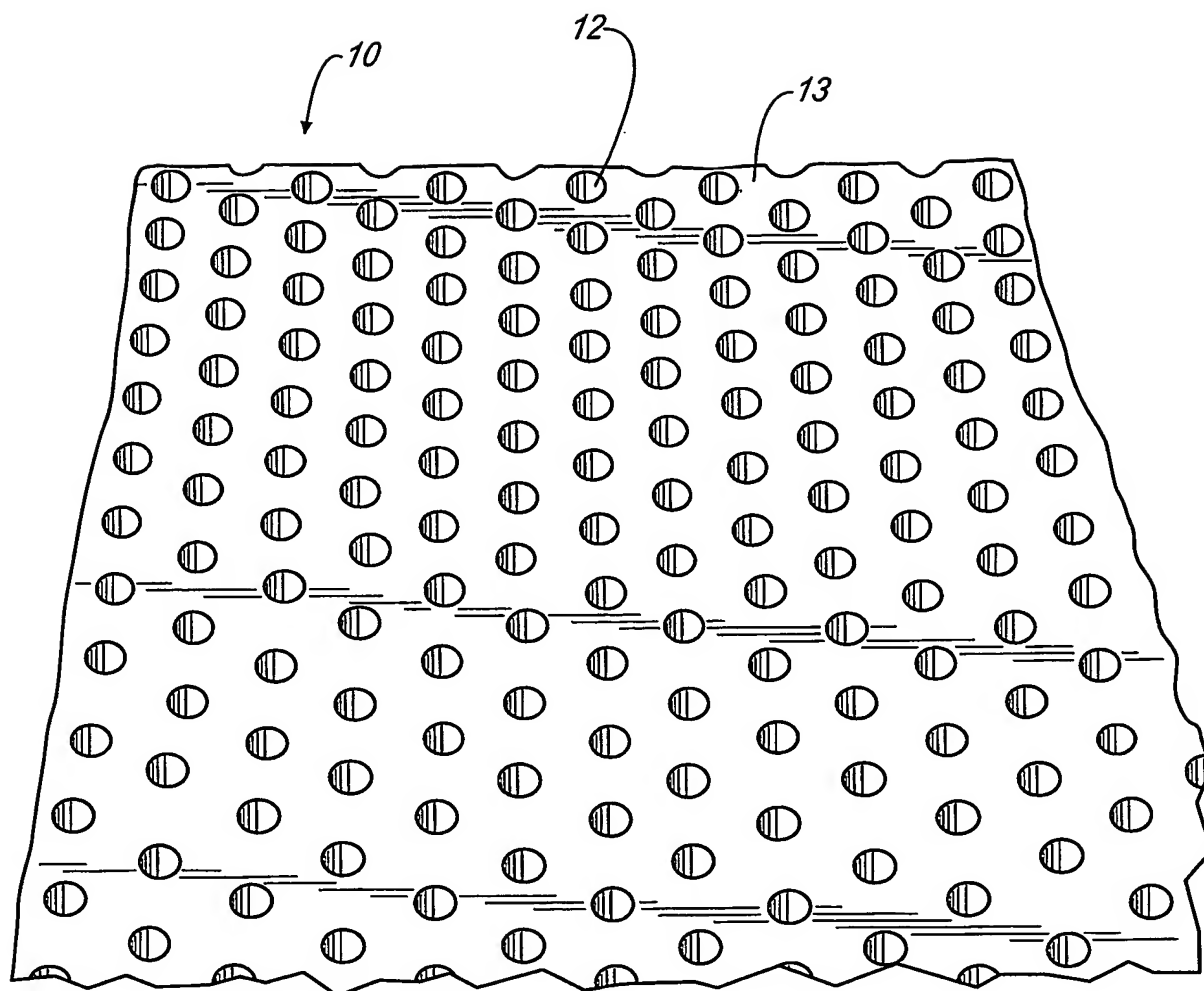


FIG. 1

2/3

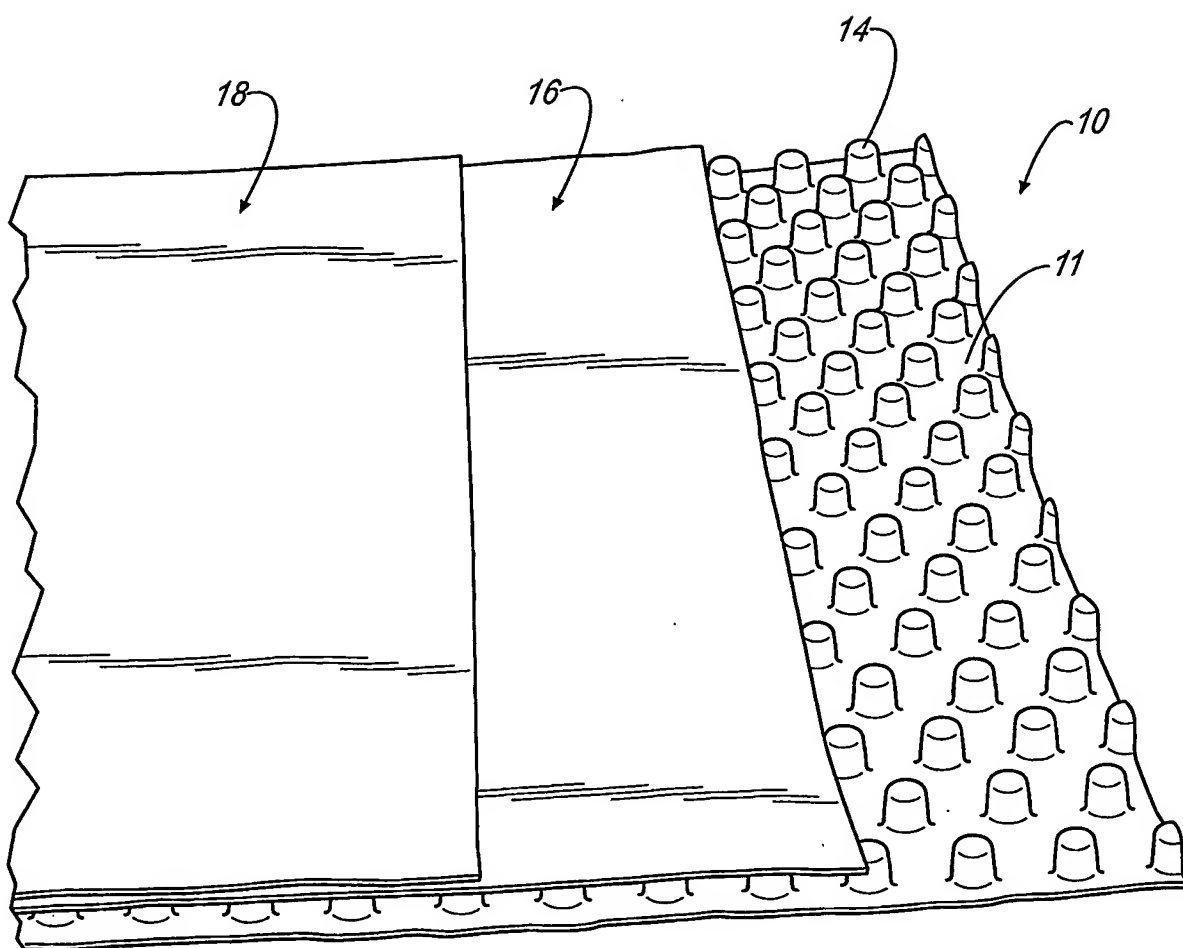


FIG. 2

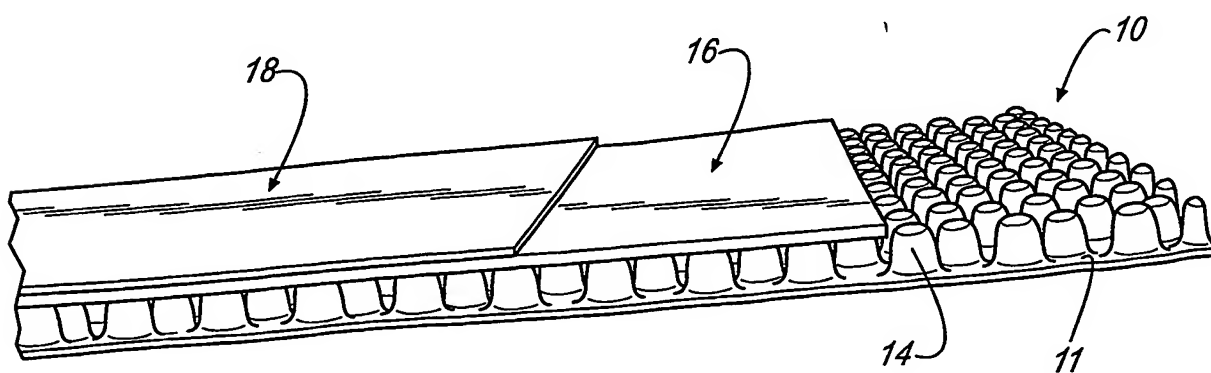


FIG. 3



3/3

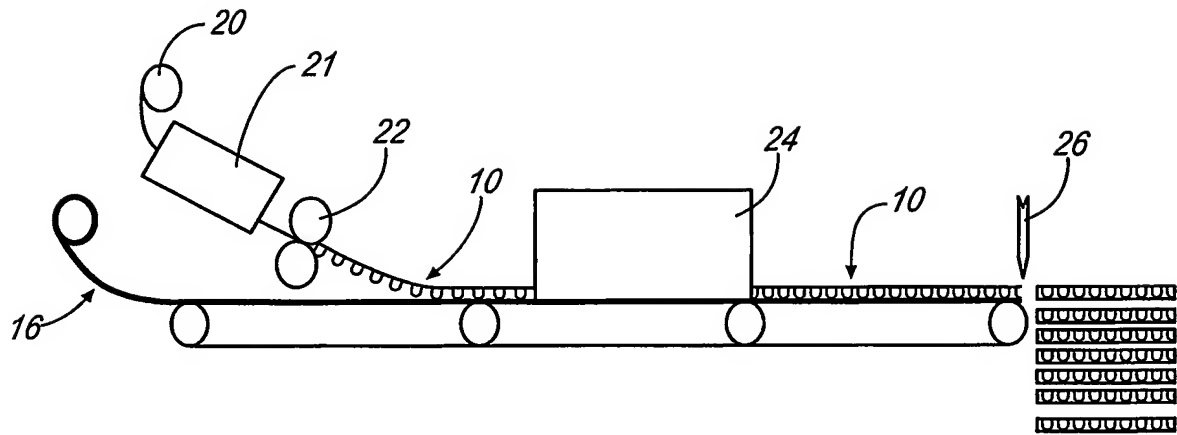


FIG. 4A

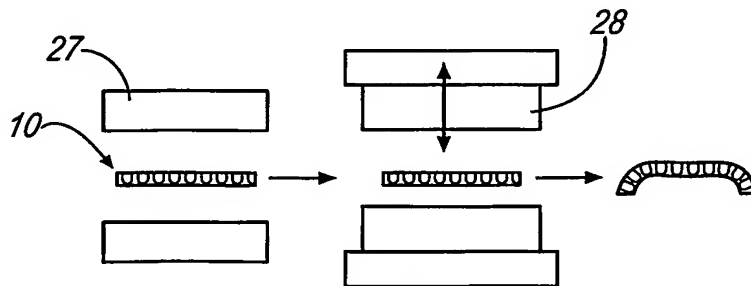


FIG. 4B

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/04135

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B60R13/02 B60R21/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B60R F16F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 345 301 A (PRINCE CORP) 5 July 2000 (2000-07-05) page 3, line 4 - line 9; figures 1,3-5,7,8 page 3, line 21 - line 29 page 4, line 6 - line 20 page 5, line 9 - line 16	1-6
X	DE 33 25 437 A (KISS G H) 27 September 1984 (1984-09-27) claims 1,8; figures 2,3	1,3,4,6



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&amp;\* document member of the same patent family

Date of the actual completion of the international search

18 July 2003

Date of mailing of the international search report

01/08/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5816 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Yildirim, I

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/04135

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2345301	A	05-07-2000	US 5879802 A	09-03-1999
			GB 2345302 A , B	05-07-2000
			DE 19739486 A1	19-03-1998
			GB 2317189 A , B	18-03-1998
DE 3325437	A	27-09-1984	DE 3325437 A1	27-09-1984